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EARLY APTITUDE-ACHIEVEMENT DISCREPANCIES AS PREDICTORS OF LATER VOLUNTARY WITHDRAWAL FROM NAVAL AVIATION TRAINING

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13 ABSTRACT

During recent years there has been a marked increase in the drop-on-request (DOR) rate among aviation officer candidates (AOC's). This type of attrition has been exceedingly difficult to predict because of a lack of good measures of motivation. This study examines the hypothesis that any substantial discrepancy between aptitude and achievement may well be a product of motivation and that scores based on such discrepancies may be useful in identifying potential DOR's. Quadrant analysis of two independent samples showed the high aptitude-low achievement quadrant to have a higher DOR rate than any other quadrant. It is recommended that this type of analysis be incorporated as a secondary selection tool upon completion of the environmental indoctrination stage of training.

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SUMMARY PAGE

THE PROBLEM

During the past 4 years (1966 - 1970) there has been a marked increase in the drop-on-request (DOR) rate among aviation officer candidates (AOC's). This type of attrition has been exceedingly difficult to predict because of a lack of good measures of motivation.

This study examines the hypothesis that any substantial discrepancy between aptitude and achievement may well be a product of motivation and that scores based on such discrepancies may be useful in identifying potential DOR's.

FINDINGS

The hypothesis that students high in aptitude but low in achievement are likely to DOR was supported. Quadrant analysis of two independent samples showed the high aptitude-low achievement quadrant to have a higher DOR rate than any other quadrant.

RECOMMENDATIONS

Aptitude-achievement discrepancy scores should be computed for each AOC student during the environmental indoctrination stage of training. Students having an AQT score of +0.5 S. D. but an academic achievement score of -0.5 S. D. (based on aerodynamic, power plant, and physiology grades) should be identified as having a high potential to DOR and be treated accordingly.

INTRODUCTION

The problem of selection for and prediction of success in the naval aviation training program has been a continually challenging one. Syllabus changes, fluctuating quotas, and current events have an impact on the development and maintenance of the naval aviation selection and prediction. Despite a lack of stability in the training program and its requirements, naval aerospace psychology, by using a multivariate test approach, has maintained a reasonably high degree of effectiveness in resolving the problem. Much of this success has been the result of a continual overlap in systematic variance between well-developed aptitude scores, achievement grades, and the pass-fail criterion. However, during the past few years there has been a rather marked change in the type of attrition in the training program. This change is reflected mainly within one category of attrition; namely, the drop-on-request (DOR) category. During the period from 1960 to 1965 the DOR rate among aviation officer candidates, referred to as AOC's, was 16 per cent (1); however, more recent data from 1966 to 1970 have shown a 50 per cent increase in DOR rate among the AOC student population, boosting the DOR rate to a disconcerting 24 per cent.

There are several possible reasons for this increase, including policy changes regarding the military future of a DOR, commissioning requirements during the peak of the Vietnam War, and deterioration of the military image. The reasons for the DOR rate increase are not relevant to the purposes of this paper. The problem rather is one of identifying the potential DOR before he begins the most expensive phase of the training program; i.e., flight training. Once the student begins flying, the cost per student increases at least eightfold.

It can be assumed that the DOR category contains a large lack-of-motivation component. The reasons for this lack are myriad and are listed in another report (2). An essential task of those involved with selection and prediction in naval aviation is to obtain a good measure of this motivational dimension. In general, personality measures and aptitude measures have produced mediocre results. As expected, achievement measures have shown some relationship with the complete versus DOR criterion.

It seems reasonable to assume that any substantial discrepancy between aptitude and achievement may well be a product of motivation. In other words, students high in aptitude but low in achievement lack motivation and are likely to DOR. Alternately, students relatively low in aptitude but high in achievement must be highly motivated and conceivably less likely to DOR.

If such aptitude versus achievement discrepancies could be discerned early in the training program, before the flying phase begins, and a disproportionate number of the high aptitude-low achievement students do, indeed, DOR, then a new measure could be used in the effort to identify potential DOR's.

PROCEDURE

The subjects used for this study were all of the AOC's who began training during calendar year 1967 and who either completed or voluntarily withdrew. For cross-validation purposes this group was randomly divided into two subgroups, Group A and Group B. Students for whom

complete data were lacking were dropped from the study; such a deletion in no way biased the results. This procedure yielded an N of 575 students for Group A and 581 students in Group B.

It was felt that the best measure of academic aptitude was the Aviation Qualification Test (AQT), which correlates well with most standard intelligence tests. As a measure of academic achievement, three academic grades, viz, power plants, aerodynamics, and physiology were combined into one score. These three courses are taken early in the training program, before the flying phase begins. Both the aptitude scores and the achievement scores were converted to standard scores with a mean = 50, and a standard deviation (S. D.) = 10.

Scores on the two variables were partitioned in order to construct two 2-by-2 actuarial tables allowing for a quadrant analysis. (Figure 1 shows the general diagram of hypothesized DOR rates for the subgroups resulting from the quadrant analysis.)

ACHIEVEMENT

AQT	HIGH	LOW
HIGH	Below Average	Very High
LOW	Very Low	Above Average

Figure 1

Hypothesized DOR Rates for AQT-Achievement Quadrants

In the first comparison, the two variables of aptitude and achievement were partitioned at the means. In the second comparison the two variables were partitioned at ± 0.5 standard deviations. In both comparisons the number of students that completed, the number of students that voluntarily withdrew, and the DOR rate were found for each quadrant.

RESULTS AND DISCUSSION

It can be seen from Table I that the hypothesized relative DOR rates shown in Figure 1 were, indeed, supported in both Group A and Group B. The lowest DOR rate existed for those students in the off-quadrant defined by below the mean AQT scores but above the mean achievement scores. Alternately, the highest DOR rate was in the other off-quadrant; i.e., high AQT and low achievement. Differences between these DOR rates were highly significant ($p < .001$) for both the validation and cross-validation groups.

Table I

Distribution of Students Who Completed or Dropped-on-Request
When AQT and Achievement Scores Are Partitioned at Mean

Group A

Academic Achievement

	> Mean			< Mean		
AQT	Complete	DOR	Rate	Complete	DOR	Rate
> Mean	122	35	22%	58	45	44%
< Mean	84	16	16%	135	80	37%

16% vs. 44%: t = 4.22 p < .001

Group B

Academic Achievement

	> Mean			< Mean		
AQT	Complete	DOR	Rate	Complete	DOR	Rate
> Mean	147	29	16%	69	43	38%
< Mean	75	12	14%	139	67	33%

14% vs. 38%: t = 2.76 p < .001

While it is of interest to know what types of students tend not to be DOR's, it is not the real problem. The crux of the problem as seen in naval aviation training is identifying who will be the DOR. Predicting the potential DOR will never be perfect; on the other hand, one should make as few misclassifications as possible. The goal then is to saturate a given predictor space with as high a DOR rate as possible and still be identifying a reasonable number of people.

For this purpose the students with more extreme scores were examined. Table II gives the results of this partitioning procedure. It can be seen that the DOR rates between the two off-quadrants were even greater, but, more importantly, the quadrant (+0.5 S. D. AQT; -0.5

S. D. achievement) designed to predict the DOR showed substantial increase in DOR rate over what was obtained when the scores were partitioned at the means. When groups A and B were combined or compound probabilities were computed, this quadrant had a statistically significant ($p < .01$) higher DOR rate than any other quadrant.

Table II

Distribution of Students Who Completed or Dropped-On-Request When AQT and Achievement Scores Are Partitioned $\pm$ 0.5 S. D.

Group A

Academic Achievement

	+0.5 S. D.			-0.5 S. D.		
AQT	**Complete**	**DOR**	**Rate**	**Complete**	**DOR**	**Rate**
+0.5 S. D.	63	23	27%	14	16	53%
-0.5 S. D.	30	5	14%	53	38	42%

14% vs. 53%: t = 3.51 p < .001

Group B

Academic Achievement

	+0.5 S. D.			-0.5 S. D.		
AQT	**Complete**	**DOR**	**Rate**	**Complete**	**DOR**	**Rate**
+0.5 S. D.	88	17	16%	14	20	59%
-0.5 S. D.	19	2	10%	67	41	38%

10% vs. 59%: t = 4.71 p < .001

It seems reasonable to assume that this DOR quadrant could be made even more "valid" by considering more extreme scores. What partitioning points should be used is the decision of those making administrative decisions in the training command. Some decisions will take into consideration the number of false positives or false negatives that can be tolerated. These in turn will be influenced by changing quotas faced by the Naval Air Training Command. However, the simple but effective technique described above provides a flexible tool in identifying some of the potential DOR's plaguing naval aviation training today.

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